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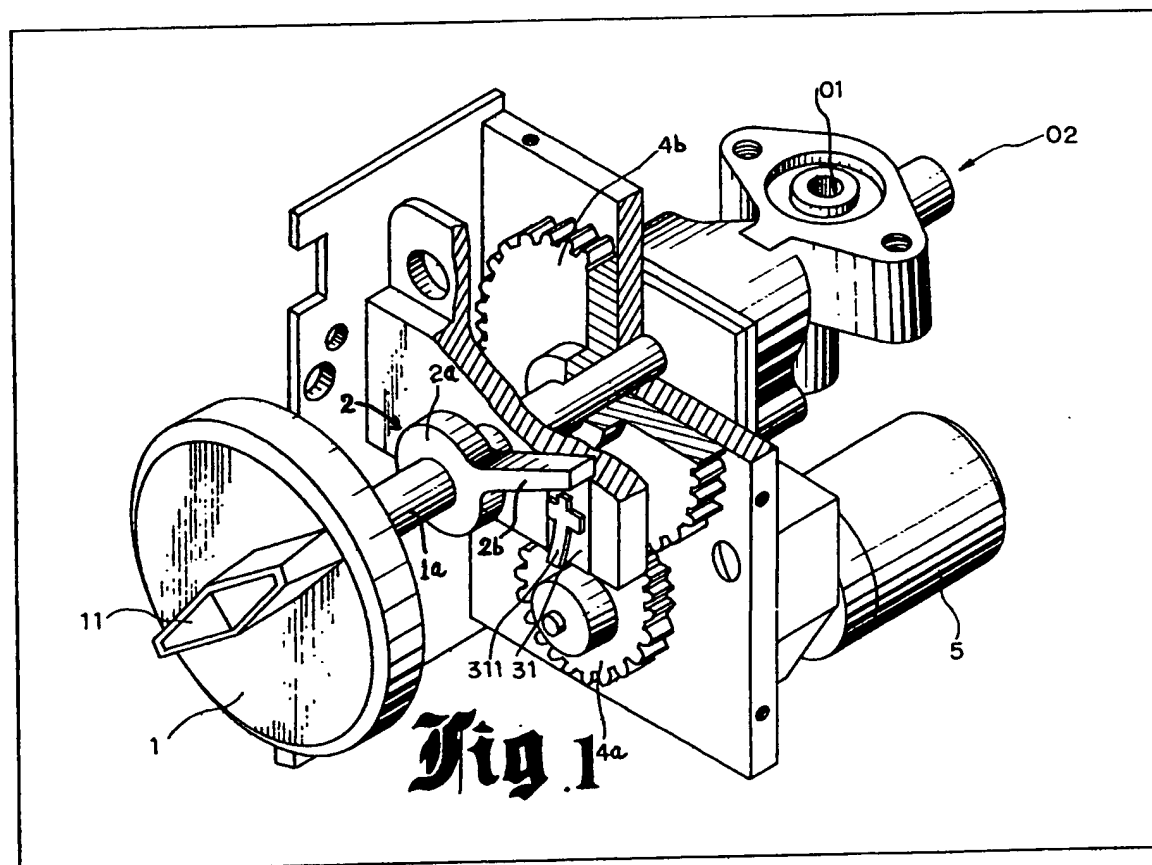
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(54) Automatic shutdown apparatus
for domestic gas cookstoves

(57) A gas valve (not shown) between a gas inlet O_1 and outlet O_2 is operated by turning of a shaft 1a by means of a knob 1. In addition, an electric motor 5 is connected with the shaft by gears 4a, 4b. An actuator 2b on the shaft actuates a microswitch 31 to switch on the supply to the motor. An electrical circuit incorporates a flame-sensor and a relay which operates to cause the motor to turn off the gas valve when the flame being sensed is unintentionally extinguished.



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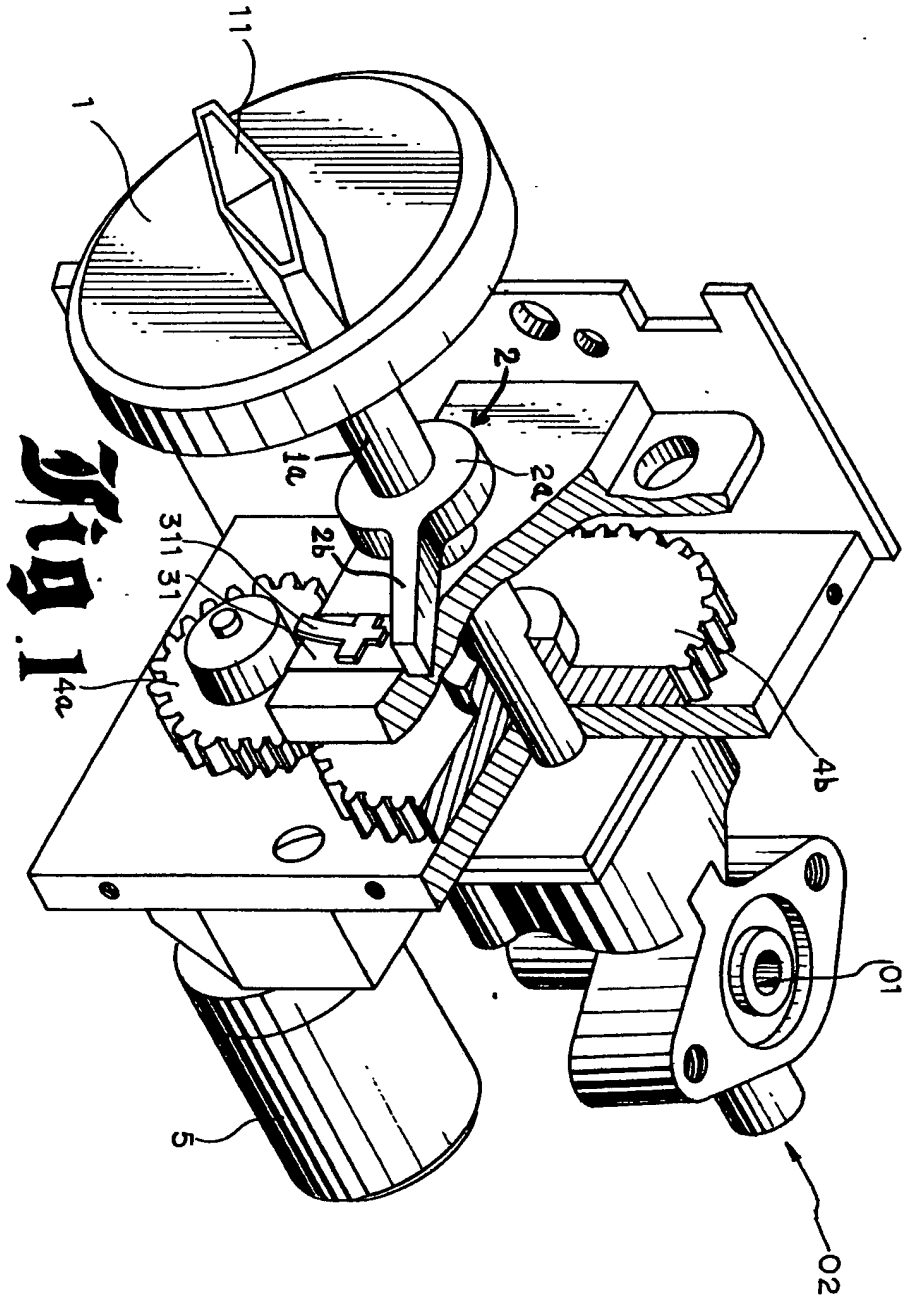
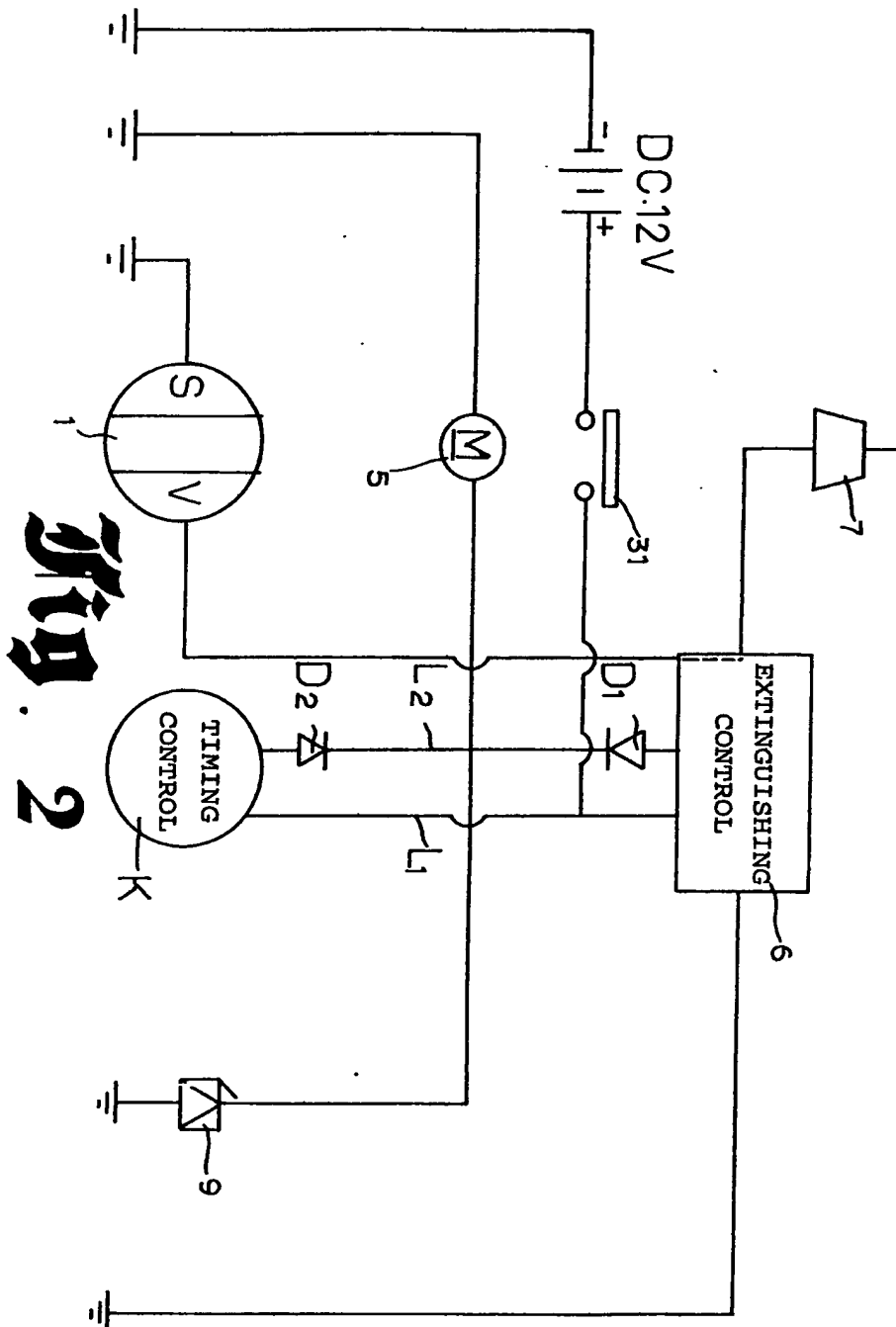


Fig. 1



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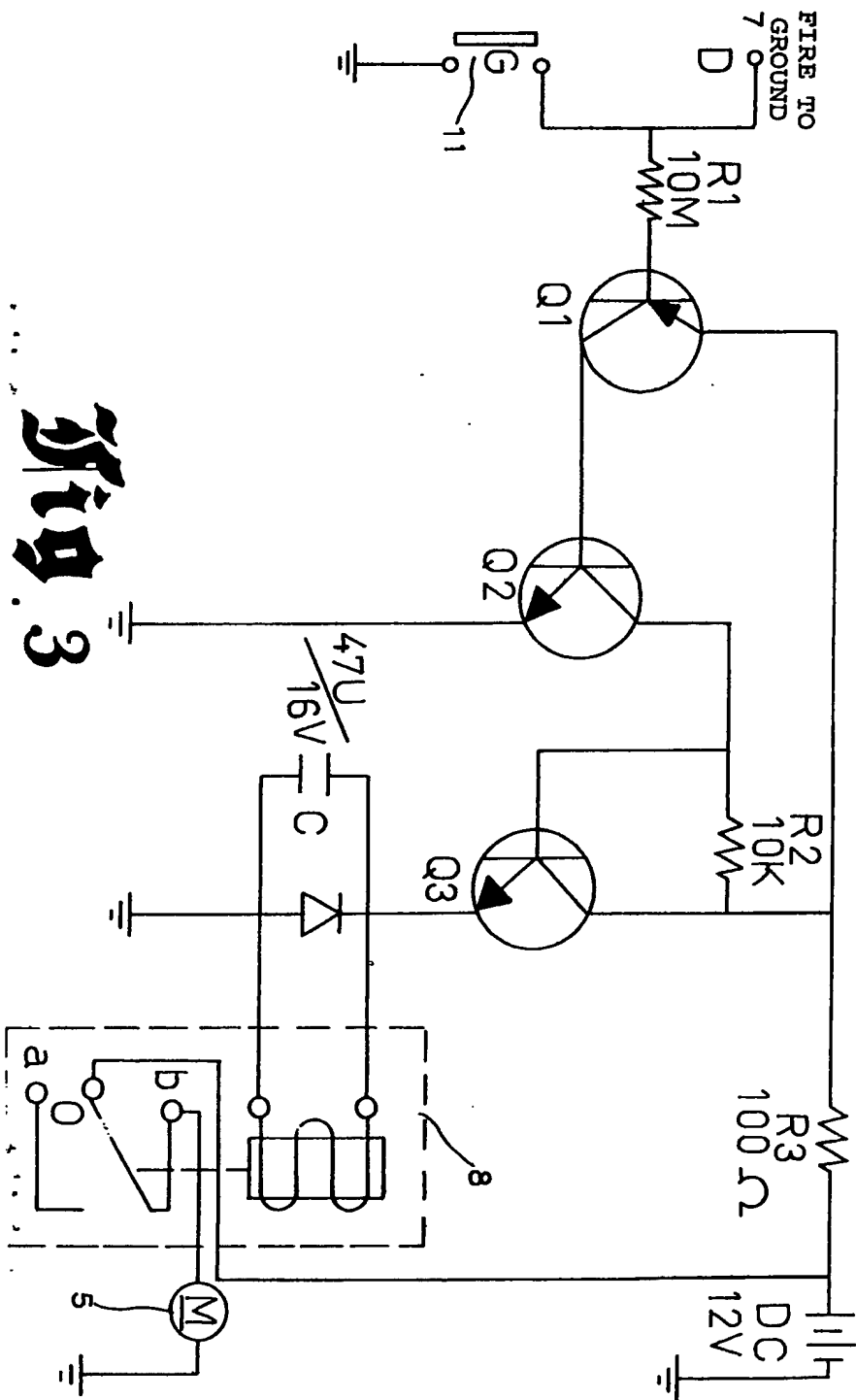


Fig. 3

SPECIFICATION

Automatic shutdown apparatus for domestic gas cookstoves

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The present invention relates to an improved safety, automatic shutting means applied to house cookstoves which can shut off the gas immediately when the fire is undesirably extinguished by some causes, and give out a warning signal simultaneously.

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The currently available gas fuels, including compressed oil gas (i.e. liquefied propane or butane stored in steel bottles for use) coal gas and natural gas (the latter two types supplied by gas main) are the most widely used means for domestic cooking and heating except for electricity. Gas fuels, however, are highly inflammable, so that escapes are liable to cause explosions and fires and, in addition, they are liable to cause suffocation, or, in the case of coal gas, particularly, gas poisoning. Coal gas contains carbon monoxide, which is so poisonous that even a concentration as low as 0.03% in the atmosphere can cause death. Oil gas and natural gas are not poisonous but can cause suffocation. Investigating the causes of such disasters, we find more often than not, they result from the unnoticed extinguishing of a burning flame for example due to wind, or the overflowing of boiling water, so that the gas escapes.

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The present invention provides automatic shutdown apparatus for a domestic gas cooker for shutting off the gas supply when a flame is unintentionally extinguished, the apparatus comprising a gas valve, manual means for controlling the gas valve, power means including an electric motor for controlling the gas valve and a flame-sensing electrical device for switching on the motor to turn off the gas valve when the flame is extinguished.

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Reference is made to the accompanying drawings, wherein:-

Figure 1 is the perspective view of shutdown apparatus according to this invention;

Figure 2 is a wiring diagram showing how the apparatus is operated; and

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Figure 3 is a detailed circuit diagram of an extinguishing controller of the apparatus.

With reference now to the drawings, particularly *Figure 1* thereof, gas enters the shutdown apparatus through an inlet O_1 , and leaves from an outlet O_2 to reach the nozzles (not shown in the drawing) where it is burned. A knob 1 controls opening and closing the gas passage by turning of a shaft to operate a valve (not shown). The passage is opened when knob 1 is turned in a clockwise direction, and closed when the latter is turned counter-clockwise. An actuator 2 has a collar 2a coaxially mounted on the same shaft 1a and an actuating arm 2b which actuates a microswitch 31. When the knob 1 is turned clockwise, the arm 2b contacts a touch-triggered-member 311 of the micro-switch and switches on an electric current to an extinguishing controller (6) (See *Figure 2*). A flame sensor 7 is provided and this switches off the current to the controller 6 when heated by a flame but switches on the current on cooling, if the flame is extinguished. A

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current is then fed to a motor 5 which turns the shaft 1a counterclockwise to switch off the gas, the motor being connected to the shaft through gears 4a, 4b.

The actuating arm 2a is, therefore, moved away from the microswitch 31 to cut off the electricity supply to the motor 5. An electrically operated audible alarm 9, such as a buzzer, is operated. The knob 1 is provided with a touch-triggered-grounding means 11 whereby the user can earth it with a mere touch (See *Figure 3*). This earths relay 8 and prevents its operation to switch on the electricity supply when the knob is being moved to control the outflow of gas.

Referring to *Figure 3*, when the gas stove is being used, earthing is accomplished by means of "flame-to-ground", or by touching touch-triggered-grounding means 11 so that either G or D becomes potentially negative with respect to the ground. Once the base of transistor Q_1 gains a negative potential, the emitter and the collector will be electrically connected to enable the collector to send out a positive signal to the base of transistor Q_2 , which base, after having been positively biased in this way, functions to allow a current to cross the junction between the emitter and collector of transistor Q_2 , and earths to counteract the base bias which is provided by resistor R_2 to transistor Q_3 , therefore providing a bias for the base of transistor Q_3 inasmuch that a current may flow through resistors R_3 , R_2 and the junction between collector and the emitter of transistor Q_2 to ground to build up a complete loop circuit. While transistor Q_3 , lacks base bias the relay 8, does not operate. When the flame goes out, D (or G) is no longer earthed and the base of transistor Q_1 fails to obtain a negative bias, so it does not work. Neither does transistor Q_2 . As a result, a current passes resistor R_3 and R_2 to bias the base of transistor Q_3 to allow a current to cross the junction between the collector and emitter thereof to enter relay 8 to result in the connection of point a to point b. An output of 12 volt DC thus pass through the (a, b) connection to provide the power for the operation of the motor 5 to switch off the gas.

A timing control device K is provided (*Figure 2*) to control the duration of burning. This is inserted between the power source and motor 5 and operates to actuate the motor both for switch-on and switch-off of the gas supply.

The above described apparatus can be inexpensively manufactured because of its simple construction. Use of electricity is confined to the transient moments in which the motor 5 is operated, so that the cost of operation is negligible. As shown, a battery is used to supply the power, but a rectified 12 volt supply may be obtained from AC mains.

CLAIMS

1. Automatic shutdown apparatus for a domestic gas cooker for shutting off the gas supply when a flame is unintentionally extinguished, the apparatus comprising a gas valve, manual means for controlling the gas valve, power means including an electric motor for controlling the gas valve and a flame-sensing electrical device for switching on the motor

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to turn off the gas valve when the flame is extinguished.

2. Automatic shutdown apparatus according to Claim 1, including an electrically operated alarm device which is operated when the motor is operated.

3. Automatic shutdown apparatus according to Claim 1 or 2 including a controller having circuit means including a relay, the relay being inoperable when said circuit is earthed, but when the earth connection is broken switches electrical current to the motor, the flame-sensing device serving to control said earth connection.

4. Automatic shutdown apparatus according to Claim 3 wherein said manual means serves to earth said circuit when the manual means is grasped by a person.

5. Automatic shutdown apparatus according to any preceding Claim including a switch actuable by said manual means to disconnect the motor from its electrical supply when the gas valve is turned off.

6. Automatic shutdown apparatus according to any preceding Claim wherein said motor is connected by gears to a shaft which is rotatable to operate the gas valve, said manual means being a knob on the shaft.

7. Automatic shutdown apparatus according to Claim 6 as appendant to Claim 5, where said switch is a microswitch actuable by an actuating arm mounted on said shaft.

8. Automatic shutdown apparatus according to any preceding Claim, including a timing control device for timing supply of electrical power to the motor to turn off the gas supply after a selected period.

9. Automatic shutdown apparatus for a domestic gas cooker constructed substantially as herein described with reference to the accompanying drawings.